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Imaging of Pediatric Testicular Problems

THE MOST COMMON of the testicular problems for which imaging is recommended is cryptorchidism. Undescended testes can be identified noninvasively with ultrasonography, computed tomography, and magnetic resonance imaging. These modalities work best when the testis is in the groin and are least sensitive for intra-abdominal testes. Hence, testes that are palpable on a careful physical examination are most likely to be identified by imaging; those that are not palpable are most likely to be missed. Therefore, imaging for undescended testes is not clinically helpful and, in this era of limited resources, is not cost-effective.

Boys presenting with an acutely inflamed scrotum are another group for whom imaging is used to establish the diagnosis of testicular torsion. Radionuclide testicular scanning (often with pin-hole collimation) has proved reliable in detecting testicular blood flow. Color-flow Doppler studies have been used in adults and seem accurate, but thus far their reliability in prepubertal children has as yet not been established. The major drawback to any imaging study in acute scrotal inflammation is the time required to do the study. Because successful salvage of a testis in patients with testicular torsion inversely depends on the length of the time the testis has been ischemic, only if studies can be obtained within 30 to 60 minutes is their use appropriate, and then only to refute the diagnosis of torsion of the testis. If torsion of the testis is a serious consideration in the differential diagnosis, it is often best to omit confirmatory imaging studies and to proceed directly and expeditiously to surgical exploration.

Testicular tumors can be imaged with ultrasonography. The identification of a cystic lesion in the testis may result in enucleation of the lesion rather than orchiectomy. A solid lesion within or replacing the testis most likely is a tumor, and radical orchiectomy can be performed with confidence. Cystic lesions in a prepubertal testis most often represent a teratoma or epidermoid cyst, both of which are uniformly benign before puberty and therefore lend themselves to a testis-sparing procedure.

GEORGE KAPLAN, MD
San Diego, California

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Urologic Laparoscopic Procedures

MANY UROLOGIC APPLICATIONS of laparoscopic surgery have been developed over the past several years. In particular, laparoscopic lymph node dissections for prostate cancer staging and laparoscopic varicocele ligation have been used extensively. As urologists' skill levels and instruments improve, these procedures will be further refined and new procedures developed. In turn, minimally invasive laparoscopic procedures can be compared to standard open surgical procedures with respect to efficacy and morbidity.

In patients with prostate cancer, the state of the obturator lymph nodes provides important prognostic information. Obturator lymphadenectomy, when done laparoscopically, is associated with minimal morbidity, and the yield in the lymph node harvest is comparable to an open transabdominal procedure. In patients undergoing radical prostatectomy, many urologists are now using the perineal approach after a staging laparoscopic lymphadenectomy, so patients can avoid any major abdominal incisions.

Laparoscopic varicocele ligation appears to be as efficacious as the open approach. The morbidity is similar and also minimal, but the procedure may be more advantageous in bilateral cases. In children with undescended testes, laparoscopy can be both diagnostic and therapeutic. Intersex problems can also be treated laparoscopically, for example, in gonadectomy. Female patients with stress urinary incontinence have been treated with standard open repairs (Marshall-Marchetti-Krantz or Burch) or a minimally invasive approach (Stamey or Raz procedure). The laparoscopic approach to the former procedures combines the anatomical soundness of these repairs with their minimal morbidity.

As more laparoscopic experience is gained, more complex procedures have been attempted. The results of nephrectomy, pyeloplasty, partial nephrectomy, renal cyst excision, and adrenalectomy have all been reported in initial series. Whereas the first attempt at these procedures has been associated with prolonged operative times, the experience with most investigators is rapidly increasing. Ureterolysis, ureterolithotomy, and other retroperitoneal procedures, such as lymphadenectomy for clinical stage A testis tumor, have been done.

For these newer, albeit investigational, laparoscopic procedures to become standard, they must not only be associated with equivalent or improved morbidity and efficacy, but also be cost-effective. Initial prolonged operative times and the high use of expensive disposables must be offset by the advantages of the newer procedure.

ROBERT I. KAHN, MD
San Francisco, California

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Prostate-Specific Antigen in Screening for Prostate Cancer

PROSTATE-SPECIFIC ANTIGEN (PSA) is a serine protease produced by prostatic epithelial cells, with minute quantities "leaking" into the serum. The serum level of PSA is frequently elevated in disease states of the prostate such as infarction, inflammation, benign prostatic hyperplasia, and carcinoma. Although routine digital rectal examination of the prostate gland does not substantially elevate serum PSA levels, other forms of prostatic manipulation—urethral catheterization, prostatic massage, cystoscopy, prostatic biopsy, or transurethral resection of the prostate—will. Recent studies have shown that screening serum PSA determinations usually detect clinically significant prostate cancer before any signs of the disease appear and are more reliable than digital rectal examination when either method is used alone. Digital rectal examination should not be omitted because as many as 20% of men treated for curable prostate cancer with cancer that is digitally palpable have a PSA level in the normal range.

In 1993 the American Cancer Society recommended that men between the ages of 50 and 70 with a ten-year life expectancy should undergo annual digital rectal examinations and serum PSA tests for screening for prostate cancer. Because of the higher incidence of presumably more aggressive prostate cancer in African Americans, it has been proposed that annual screening in this group begin at age 40. Recent evidence supports the recommendation that men with a family history of prostate cancer be seen at an earlier age than men with no hereditary history, with screening also starting at age 40.

Any patient with a palpable, firm nodule on the prostate that suggests prostate cancer should be considered for a biopsy, irrespective of the PSA value. Likewise, any patient with a PSA level above 10.0 μg per liter should also be strongly considered for biopsy because as much as 70% of the time they will have a biopsy specimen revealing carcinoma. In patients with a serum PSA level between 4.0 and 10.0 μg per liter without a suspicious nodule on digital rectal examination, transrectal ultrasonogram-guided biopsy may be done or the patient may be actively observed with a repeat digital rectal examination and a PSA test in six months. The prostate cancer detection rate in these patients is about 25%, with most patients showing benign prostatic hypertrophy on biopsy. Nevertheless, a serum PSA elevation of 0.75 μg per liter in one year is worrisome for carcinoma and warrants a biopsy being done.

Screening for prostate cancer with digital rectal examination and PSA tests detects cancer in its earlier stages. In the recent Prostate Cancer Awareness Week screening efforts, about 3% of the patients with cancer detected had

disseminated disease at the time of diagnosis. Prostate cancers that are detected only by slight PSA elevations are often of large volume and high grade, indicating that routine screening with PSA tests does not detect a high proportion of "latent," "clinically insignificant," "autopsy" carcinomas. It is recognized that prostate tumors usually grow slowly; strong consideration should therefore be given to any underlying medical conditions that might decrease the life expectancy of a patient and negate any possible benefit of therapy. Although early prostate cancer is detected using these combined methods, the question of "lead-time bias" has been raised regarding the effectiveness of early cancer detection programs. Longitudinal studies of the effectiveness of PSA screening programs are in progress.

Finally, although it is estimated that it costs \$2,000 to detect one case of prostate cancer through mass screening efforts, this cost compares favorably with the estimated \$12,000 to \$14,000 per case of breast cancer detected in mass screening trials. Clearly, intelligently designed mass-screening protocols for the early detection of prostate cancer, using digital rectal examination and PSA levels, is a simple, cost-effective method of detecting clinically significant prostate cancers in their earlier stages.

FRANK J. MAYER, MD
E. DAVID CRAWFORD, MD
Denver, Colorado

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Treating Impotence

IN A RECENT SURVEY of urologists, 85% reported treating patients with impotence with penile pharmacologic injections, vacuum erection devices, or surgically implanted prostheses. The practice of empirically giving testosterone injections has given way to a more advanced approach to diagnosis and treatment. Evaluation includes a history, physical examination, and elective endocrine studies including serum testosterone, prolactin, or luteinizing hormone levels. Office evaluation usually includes the intracavernous administration of one or a combination of vasoactive agents: prostaglandin E, papaverine hydrochloride, or phentolamine. Observing the erectile response, rigidity, penile curvature, and the rapidity of detumescence provides further information by which a patient's condition can be categorized as vascular (arterial insufficiency or venous leakage), neurogenic, endocrine, traumatic, or psychogenic. It is estimated that in more than 80% of impotent patients, the problem is organic in origin. Further testing may include nocturnal penile tumescence monitoring, duplex Doppler ultrasonography of the cavernosal arteries, dynamic infusion cavernosometry and cavernosography, and angiography. Use of these tests should be selective and tailored to a patient's treatment goals.